REMARKS

Claims 19-28, 30-39, and 41-42 are pending and stand rejected. Claims 19 and 30 are amended herein.

101 Rejection

Claims 30-39 and 42 were rejected under 35 USC 101 as reciting non-statutory subject matter. Examiner stated that although claim 30 recited a system, the body of the claim lacked definite structure indicative of a physical apparatus (Detailed Action, page 3). Claim 30 has been amended to recite "A system for recognizing faces of persons, comprising: …; a computer readable storage medium storing an indicator component module …; and a processor configured to execute the indicator component module stored by the computer readable storage medium." The claim elements "computer readable storage medium" and "processor" are structure indicative of a physical apparatus. Thus, the system recited in claim 30 complies with 35 USC 101. Claims 31-39 and 42 depend from claim 30 and also comply with 35 USC 101.

103(a) Rejection based on Heisele, Pentland, and Li

Claims 19-20, 24-28, 30-31, 35-39, and 41-42 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Heisele ("Face Recognition with Support Vector Machines") in view of Pentland ("View-Based and Modular Eigenspaces for Face Recognition") and Li (US 7,024,033). Applicant traverses. Additionally, for the record, Applicant traverses Examiner's assertions regarding the motivation to combine Heisele, Pentland, and Li.

On February 3, 2010, Examiner and the undersigned attorney discussed claim 19 (as previously pending) and Pentland. Specifically, they discussed the following claim limitations (emphasis added):

> determining, from the first set of facial components, <u>a subset of facial components</u> that are associated with the body part classification; and
> determining a probability that a person class of <u>the subset of facial components</u> is the first person;

No agreement was reached.

Claim 19 is hereby amended to clarify the above claim limitations. As amended, claim 19 recites (emphasis added):

> determining, from the first set of facial components, a subset of facial components that are associated with the body part classification, <u>wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints</u>; and
> determining a probability that a person class of the subset of facial components is the first person;

Claim 19 recites, in part, "determining a probability that a person class of the subset of facial components is the first person." This portion of claim 19 concerns the person class of <u>multiple facial components</u>, specifically, "a subset of facial components that are associated with the body part classification, wherein the facial components in the subset represent a <u>same body part classification</u> of a <u>same person</u> at <u>multiple viewpoints</u>" (emphasis added). These facial components have the <u>same body part classification</u> (e.g., "nose") and are from the <u>same person</u> at <u>multiple viewpoints</u>.

A probability is calculated that the person class of these facial components is a particular person. For example, a classifier receives as input three "noses" that are from the same person at multiple viewpoints. The classifier then determines the probability that the three noses belong to

a particular person. Note that the recognition/classification is performed based on multiple facial components.

The hypothetical combination of Heisele, Pentland, and Li does not disclose, teach, or suggest the claimed element "determining a probability that a person class of the subset of facial components is the first person [wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints]."

Heisele

Applicant agrees with Examiner that Heisele does not disclose, teach, or suggest the claimed element "determining a probability that a person class of the subset of facial components is the first person" (Detailed Action, page 6).

Pentland

Pentland does not remedy this deficiency. Pentland discusses eigenspaces for face recognition (title). During the training phase, eigenspaces are approximated using a principal components analysis (PCA) on a representative sample of images of 128 faces (section 2, paragraph 2, page 84). If the images are of entire faces, then the resulting eigenspaces are referred to as "eigenfaces" (§1, ¶1, p. 84). If the images are of facial features (e.g., eye, nose, or mouth), then the resulting eigenspaces are referred to as "eigenfeatures" (§4.1, ¶3, p. 87).

During the recognition phase, an unknown person depicted in an input image is identified. Note that only one image is received as input. In order to identify the unknown person, the eigenvector description of the input image is determined (§2.1, ¶2, p. 85). This determination is performed based on the eigenspaces that were approximated during the training

phase (§2, ¶2, p. 84). Eigenvectors are also determined for images of "known" people (§2.1, ¶2, p. 85). The eigenvector for the unknown person is then compared to the eigenvectors for the known people (§2.1, ¶2, p. 85). The "known" eigenvector that is most similar to the "unknown" eigenvector is determined. The person associated with the most-similar known eigenvector is the same person who is depicted in the input image (§2.1, ¶2, p. 85).

When evaluating view-based and parametric techniques, Pentland's data consisted of 189 images consisting of nine views of 21 people (§3.2, ¶1, p. 86). The nine views were evenly spaced from -90° to +90° along the horizontal plane (§3.2, ¶1, p. 86). In other words, the views involved multiple viewpoints. When evaluating eigenface and eigenfeature techniques, Pentland's data consisted of 90 images consisting of two views of 45 people (§5, ¶1, p. 90). The two views corresponded to different facial expressions (neutral vs. smiling) (§5, ¶1, p. 90). In other words, the views did not involve multiple viewpoints.

Assume, *arguendo*, that facial features extracted from images of one of the 21 people in Pentland correspond to the claimed element "a first set of facial components extracted from facial identification training image data of a face of a first person at a first set of viewpoints."

As explained above, the phrase "subset of facial components" refers to facial components that have the <u>same body part classification</u> and are from the <u>same person</u> at <u>multiple viewpoints</u>. Assume, *arguendo*, that Pentland's extracted facial features can be grouped according to their body part classifications and that one of these groups would correspond to the claimed element "subset of facial components." Pentland still does not disclose, teach, or suggest <u>determining a probability</u> that a person class of facial features grouped in this way is a particular person. Pentland's recognition/classification takes as input <u>only one image</u> (e.g., one image of one facial feature). Pentland does not take as input multiple facial features.

It follows that Pentland does not disclose, teach, or suggest the claimed element "determining a probability that a person class of the subset of facial components is the first person [wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints]."

Li

Li does not remedy this deficiency. Li discusses boosting the performance of machine-learning classifiers (title). FloatBoost uses a method to select an optimum feature set to train weak classifiers based on the selected optimal features and thereby to construct a strong classifier by linearly combining the learned set of weak classifiers (2:33-37).

Li mentions performing face detection for images of faces at different poses or views ("multi-view faces"; 11:19, 30-31, 50). Li also mentions preprocessing training face images by roughly aligning them using the eyes and the mouth (12:21-25). Assume, *arguendo*, that facial components can be extracted from Li's multi-view images of one person and that these facial components would correspond to the claimed element "a first set of facial components extracted from facial identification training image data of a face of a first person at a first set of viewpoints."

First of all, Li discusses applying FloatBoost to face detection, not to face recognition (9:54-59). Specifically, the Li system can distinguish between an image that does contain a face and an image that does not contain a face (11:61-62; 12:16). The Li system can be used to detect face regions in an input image (12:11-12). The Li system cannot determine whose face is shown in an input image. Thus, Li does not disclose a "person class" let alone determining a person class of multiple facial components.

Also, when Li mentions performing face detection based on "features", it is referring to image features (such as color and oriented edges, 1:47-48), not facial features (such as eye, nose, and mouth). Specifically, Li's features are block differences, which are similar to steerable filters (12:43-45; FIG. 4). Each such feature has a scalar value, namely, the sum of the pixels which lie within the black rectangles minus the sum of the pixels in the white rectangles (12:46-49). So, even if Li's system did perform face recognition, it would not be based on facial components (such as eye, nose, and mouth), let alone multiple facial components of the same body part classification from the same person at multiple viewpoints.

It follows that Li does not disclose, teach, or suggest the claimed element "determining a probability that a person class of the subset of facial components is the first person [wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints]."

Since none of the references shows the claimed element "determining a probability that a person class of the subset of facial components is the first person [wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints]", then the combination of references also does not disclose, teach, or suggest this claimed element.

As a result, claim 19 is patentable over the hypothetical combination of Heisele, Pentland, and Li. Independent claim 30 recites similar language and is also patentable over the hypothetical combination of Heisele, Pentland, and Li for at least the same reasons.

<u>103(a) Rejection based on Heisele, Pentland, Li, and Gross</u>

Claims 21-22 and 32-33 were rejected under 35 USC 103(a) as being unpatentable over Heisele ("Face Recognition with Support Vector Machines") in view of Pentland ("View-Based and Modular Eigenspaces for Face Recognition"), Li (US 7,024,033), and Gross ("Growing Gaussian Mixture Models for Pose Invariant Face Recognition"). Applicant traverses. Additionally, for the record, Applicant traverses Examiner's assertions regarding the motivation to combine Heisele, Pentland, Li, and Gross.

As explained above, the hypothetical combination of Heisele, Pentland, and Li does not disclose, teach, or suggest the claimed element "determining a probability that a person class of the subset of facial components is the first person [wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints]."

Gross does not remedy this deficiency. Gross discusses using Gaussian mixture models (GMMs) to characterize human faces and model pose variance with different numbers of mixture components (abstract). Specifically, Gross discusses growing GMMs for pose invariant face recognition (title). The input to Gross' face recognizer is a stream of face images captured in a meeting room (section 3.3, paragraph 2, page 1090). As people move freely about the room, any head pose can occur (§3.3, ¶2, p. 1090). FIG. 2 shows examples of the images acquired during a meeting (§4, ¶1, p. 1090).

Assume, *arguendo*, that facial components can be extracted from Gross' facial images and grouped according to their body part classifications and that one of these groups would correspond to the claimed element "subset of facial components." Gross does not disclose, teach, or suggest a probability that a person class of the facial components in a particular group is the first person, let alone determining such a probability.

It follows that Gross does not disclose, teach, or suggest the claimed element "determining a probability that a person class of the subset of facial components is the first person [wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints]."

Therefore, claims 21-22 and 32-33 are patentable over the hypothetical combination of Heisele, Pentland, Li, and Gross.

<u>103(a) Rejection based on Heisele, Pentland, Li, Gross, and Viola</u>

Claims 23 and 34 were rejected under 35 USC 103(a) as being unpatentable over Heisele ("Face Recognition with Support Vector Machines") in view of Pentland ("View-Based and Modular Eigenspaces for Face Recognition"), Li (US 7,024,033), Gross ("Growing Gaussian Mixture Models for Pose Invariant Face Recognition"), and Viola ("Complex Feature Recognition: A Bayesian Approach for Learning to Recognize Objects"). Applicant traverses. Additionally, for the record, Applicant traverses Examiner's assertions regarding the motivation to combine Heisele, Pentland, Li, Gross, and Viola.

As explained above, the hypothetical combination of Heisele, Pentland, Li, and Gross does not disclose, teach, or suggest the claimed element "determining a probability that a person class of the subset of facial components is the first person [wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints]."

Viola does not remedy this deficiency. Viola discusses complex feature recognition (CFR), which discovers features that are effective for classifying an object across a wide variety of poses (page 7, second paragraph). The training set included 15 images for each of 10 people, where each of the 15 images had a different pose (p. 17). Each image was divided into 20

features (p. 17, last paragraph). Assume, *arguendo*, that the features from images of one of the 10 people in Viola correspond to the claimed element "a first set of facial components extracted from facial identification training image data of a face of a first person at a first set of viewpoints."

Assume, *arguendo*, that Viola's features can be grouped according to their body part classifications and that one of these groups would correspond to the claimed element "subset of facial components." Viola does not disclose, teach, or suggest a probability that a person class of the features in a particular group is the first person, let alone determining such a probability.

It follows that Viola does not disclose, teach, or suggest the claimed element "determining a probability that a person class of the subset of facial components is the first person [wherein the facial components in the subset represent a same body part classification of a same person at multiple viewpoints]."

Therefore, claims 23 and 34 are patentable over the hypothetical combination of Heisele, Pentland, Li, Gross, and Viola.

The claims not specifically mentioned above depend from their respective base claims, which were shown to be patentable over the hypothetical combination of Heisele, Pentland, and Li. In addition, these claims recite other features not included in their respective base claims. Thus, these claims are patentable for at least the reasons discussed above, as well as for the elements that they individually recite.

Examiner is invited to contact the undersigned in order to advance the prosecution of this case.

Respectfully submitted,
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